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APPLICATION FOR

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[0001] Be it known that we, Liran B. Cohen, a citizen of Israel, residing at 2410 F Dunwoody Crossing, Atlanta, Georgia 30338, and Alon Brand, a citizen of Israel, residing at 2410 F Dunwoody Crossing, Atlanta, Georgia 30338, have invented a new and useful "Chemiluminescent Vessel."

BACKGROUND OF THE INVENTION

[0002] The present invention relates generally to vessels and containers used in containing fluids. More particularly, this invention pertains to vessels used in consumer products which provide for novelty chemiluminescence by means of a two component reaction within sealed cavities of the vessel walls.

[0003] Alcohol is a favorite consumer beverage and is frequently served to the consumer in venues with reduced lighting, such as eating, drinking and dancing establishments. In such venues ambience is a critical feature. Proprietors of such establishments try to match the features of food and drink to the desired ambience favored by their clientele. More youthful and energetic consumers favor establishments providing containerized beverages. It has long been recognized that these consumers find beverages more attractive, and the activity involved in

consuming such beverages more enjoyable, if the containers associated with such consumption are provided with a novel appearance.

[0004] Luminescence in vessels or containers for food or drink is known in the prior art. U.S. Pat. No. 5,171,081, issued to Pita, et al. on December 15, 1992, discloses a double walled plastic beverage container having a chemiluminescent fluid disposed within the wall cavity. Another chemiluminescent fluid is contained separately within a compressible toroidal tube in the upper rim of the container. When the rim is flexed the toroidal tube is compressed, causing the fluid contained therein to rupture a thin membrane separating the fluids and thereby produce a chemiluminescent reaction.

[0005] In U.S. Pat. No. 6,474,467, issued to Kurdian on November 5, 2002, a re-fillable plastic luminescing bottle is disclosed. The bottle incorporates an ampule having a frangible membrane separating the individual chemilumescent fluids.

[0006] The tube, or ampule, of the prior art is relatively unprotected from crushing and thus is subject to premature activation caused by accidental or intentional crushing. Finally, the chemiluminescent novelty of the prior art container cannot be readily associated with a branded packaged beverage because and activation of the chemiluminescent is not necessarily linked to consumption of any particular beverage.

[0007] From the perspective of the prepackaged beverage field, especially the prepackaged alcoholic beverage field, the prior art chemiluminescent containers are of limited value.

[0008] What is needed is a sealable chemiluminescent container for packaging beverages having a system by which opening the sealable closure of the beverage container simultaneously activates the chemiluminescent reactants.

[0009] What is also needed is a sealable chemiluminescent container for packaging beverages having a means of protecting the compressible tube commonly used for activating the chemiluminescent reactants.

[0010] What is finally needed is a method of selecting beverages and chemiluminescent components and, then, assembling the chemiluminescent containers so that the chemiluminescent light can be used to provide information regarding a characteristic of the beverage.

SUMMARY OF THE INVENTION

[0011] A chemiluminescent vessel is constructed from a first portion having a sealable inner container held by an outer container, the outer container forming a walled cavity between the inner and outer container, and which contains a first chemiluminescent fluid. A second portion of the vessel abuts the first portion and includes a compressible toroidal tube or capsule which defines a sealed tube cavity containing a second chemiluminescent fluid. A frangible barrier, preferably

comprising the tube wall, separates the tube cavity from the walled cavity. A fluid, such as a beverage, is contained in an inner cavity of the inner container. The sidewall of the second portion terminates in a neck that has a fluid opening. Preferably, the neck sidewall is contiguous with the sidewall of the inner container.

[0012] A removable protective cap assembly is formed from an inner cap contained within and rigidly attached to an outer cap. The inner cap forms a sealed closure with the neck of the inner container. The outer cap extends to overlay the second portion of the vessel so as to form a protective barrier which shields the compressible toroidal tube from accidental compression. In a preferred embodiment, removal of the protective cap causes a compression tab to engage and compress the tube sufficiently to rupture the frangible barrier. The first and second chemiluminescent fluids mix within the wall cavity producing a chemiluminescent reaction concurrent with the unsealing of the inner container containing the beverage.

[0013] Advantageously, the first and second chemiluminescent fluids are selected to produce, when mixed, a specific color connoting a characteristic of the beverage contained in the inner container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Fig. 1, 1A and 1B are cross-sectional views of one embodiment of the chemiluminescent vessel of the present invention, with Fig. 1A being an enlarged

partial view of the embodiment of Fig. 1 and Fig. 1B being the embodiment of Fig. 1 showing the cap assembly removed.

[0015] Fig. 2 is an under-side view of the cap assembly of the embodiment shown in Fig. 1.

[0016] Fig. 3 is a over-head view of the inner and outer containers of the embodiment shown in Fig. 1.

[0017] Figs. 4A, 4B, and 4C are cross-sectional views of three embodiments of the chemiluminescent vessel of the present invention, each view showing details of the toroidal tube and common upper rim of one embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring now to Figure 1, a chemiluminescent vessel **10** is shown. The vessel **10** comprises a first or lower portion constructed to form a double walled container **12** having an inner perimeter defined by inner sidewall **20a** and an outer perimeter defined by outer sidewall **20b**. Container **12** is shaped and adapted such that the portion of the container topographically within the inner sidewall **20a** defines an inner fluid cavity or reservoir **22**, adapted to contain a fluid **100**, such as a beverage. A sealed walled cavity 24 is disposed within the double walled container **12** between inner sidewall **20a** and outer sidewall **20b** and contains a first chemiluminescent fluid **110**.

[0019] Referring now to Figures 1, 1A, 1B and 3, vessel **10** comprises a second or upper portion **14** having a sidewall **30** contiguous with inner sidewall **20a** of first portion **12**. Sidewall **30** forms a shoulder **30a** where it meets inner sidewall **20a**. The sidewall **30** terminates in a neck **32**, which defines a fluid opening **33**. The neck **32** has exterior lands **34** adapted to receive a closure device, such as by threaded engagement. The sidewall **30** and inner sidewall **20a** are preferably composed of a translucent material that is a yieldingly deformable material as well. Suitable materials include extruded plastics adapted for drinking containers. Other suitable materials include glass, hard plastics and metals suitable for beverage containers. Still other suitable materials would be obvious to one skilled in the art. Where the vessel **10** is intended to contain fluids **100** other than beverages, other suitable materials adapted to contain the intended fluid would be obvious to one skilled in the art.

[0020] A compressible tube **40** is disposed at or adjacent to the base of wall **30**, where it meets inner sidewall **20a** at shoulder **30a**. The compressible tube **40** is formed with a tube wall **42** which is frangible along at least a portion **42a** of its circumference; more particularly, frangible portion **42a** of tube wall **40** is that portion which will permit fluid communication between the interior of compressible tube **42** and sealed wall cavity **24**. The interior of the compressible tube **40** defines a sealed tube cavity **44**, which contains a second chemiluminescent fluid **120**. The frangible barrier **42a** separates the tube cavity **44** from the wall cavity **24**. A

removable, protective cap assembly **50** is shown in Figures 1 and 1A received on the second portion **14** of the vessel **10**. The protective cap assembly **50** includes a sidewall **50a** which forms a protective barrier which shields the compressible tube **40** from accidental or premature compression.

[0021] As shown in Figure 2, the protective cap assembly **50** includes a structure adapted to compress the tube **40** during removal of the protective cap assembly **50** from the vessel **10**. In this embodiment the compression structure is a compression tab **52**, although other structures serving the same function could be substituted for the compression tab **52**. Rotational removal of the protective cap assembly **50** causes the compression tab **52** to engage and compress the tube **40** sufficiently to rupture the frangible barrier **42a**. Upon rupture of the frangible barrier **42a**, the first chemiluminescent fluid **110** and the second chemiluminescent fluid **120** mix within the wall cavity **24**.

[0022] In the embodiment shown in Figure 1, the protective cap assembly **50** is adapted to form a rotatably separable closure with vessel **10** so as to contain the fluid **100** within the vessel **10**. The invention contemplates use of a removable closure, such as a lid, sealably spanning the inner perimeter **20a** of vessel **10**.

[0023] The mixing of the first and second chemiluminescent fluids **110**, **120** following rupture of the frangible barrier **42a** results in a chemiluminescence reaction. The chemiluminescence reaction occurs within the wall cavity **24** and produces light without producing significant heat. Thus, the chemiluminescent

vessel **10** may be safely handled during the chemiluminescence reaction without the need for protecting a user from heat. The color of the light produced by the reaction is dependent upon the specific chemicals used to make the components of the reaction, i.e. the specific first and second chemiluminescent fluids **110, 120** employed. Any of a number of colors of light can be selectively produced in a chemiluminescence reaction by selecting the corresponding reactant chemicals as the first and second chemiluminescent fluids **110, 120**. Chemiluminescent fluids which can be used in connection with the present invention are well known. Preferably, the first chemiluminescent fluid is an oxalent such as, for example, the oxalent ester present as a solution in the selected propolyene glycol vihydrocardyl ethyl solvent. The oxalent may include the solvent and the fluorescent or just the solvent. The second chemiluminescent fluid comprises the activator capable of providing the desired chemiluminescent effect when combined with the oxalent in a manner well known in the prior art and may include any of a number of well-known, readily, commercially available activators.

[0024] The outer sidewall 58 of double walled container **15** is constructed of a translucent material to permit the luminescence to be perceived. Suitable translucent materials would include translucent glass and translucent plastics. More preferably, the outer sidewall **58** and inner sidewall **57** are each formed from a yieldingly deformable material, such as extruded plastics commonly used with beverage containers.

[0025] Figure 1 shows a compressible, interrupted toroidal tube **40** monolithically formed with the frangible barrier **42a**. As noted, the interior of the interrupted tube **40** forms a sealed toroidal tube cavity **44** which contains a second chemiluminescent fluid **120**. The frangible barrier **42a** separates the wall cavity **24** and the toroidal tube cavity **44**. The interrupted toroidal tube **40** is recessed from the top of outer sidewall **20b** and extends along a circumferential portion of the inner sidewall **20a**.

[0026] A removable protective cap assembly **50** is shown having an outer cap wall **50a** and an outer cap top **50b**. The outer cap wall **50a** is received over the second portion **14** of vessel **10** and is adapted to form a protective barrier over the toroidal tube **40**. The protective cap assembly **50** further includes a compression tab **52** adapted to compress the interrupted toroidal tube **40** upon the removal of the protective cap assembly **50**. This compression is sufficient to cause the frangible barrier **42a** to rupture and to allow the first and second chemiluminescent fluids **110**, **120** to mix and produce a chemiluminescent reaction. In the embodiment shown in Figure 1, an upper end **20b'** of outer sidewall **20b** is adapted to receive the protective cap assembly **50** so as to form a sealable closure at the outer sidewall **20b**. In this embodiment the protective cap assembly **50** is rotatably removable from vessel **10** so as to form a rotatably separable closure. One type of closure means employed by an alternative embodiment of the invention comprises exterior lands attached to the upper end **20b'** and further comprises interior lands of the

outer cap wall received by such exterior lands. It would be obvious to one skilled in the art to employ another known method to form closures.

[0027] In another embodiment of the invention, illustrated in Figure 4A, a toroidal tube **40** of this embodiment is disposed beneath a common upper rim **25** of inner sidewall **20a** and outer sidewall **20b**, and maintained in place by ledges **25a** and **25b** and within sealed wall cavity **24**. In this embodiment, common upper rim 25 is formed from a flexible plastic material such that the common upper rim **25** is readily deformable. The toroidal tube **40** is formed with a frangible wall barrier **42**, but is separate from the common upper rim **25**. The frangible barrier **42** separates the wall cavity **24** and the toroidal tube cavity **44**. The frangible barrier **42** is disposed directly below the flexible common upper rim **25** such that sufficient deformation of the flexible common upper rim **25** will cause the frangible barrier **42** to rupture. In this embodiment, the outer wall **20b** of vessel **10** can be formed from a hard plastic. The termination of the outer wall **20b** provides a cap **50** receiving area **21**. In this embodiment, the frangible barrier **42** and the flexible common upper rim **25** extend upwardly beyond the termination of the outer wall **20b** and the cap receiving area **21**. In variations of this embodiment, cap receiving area **21** can receive an outer cap wall **51a**, which forms a protective barrier.

[0028] Referring now to Figure 4B, an embodiment incorporating the features of the embodiment of Figure 4A is shown. In this embodiment a protective outer collar **26** is disposed upon the outer wall **20b** at the termination with the common

upper rim 25. The protective outer collar **26** is made of a hard material such as hardened plastic and forms a portion of the protective barrier. In one variation of this embodiment the height of the protective outer collar **26** is such that the protective outer collar **26** extends upwardly beyond the frangible barrier **42** and the flexible common upper rim **25** such that the protective outer collar **26** provides a complete lateral shield. In another variation of this embodiment the height of the protective outer collar **26** is such that the protective collar **26** extends upwardly but not beyond the frangible barrier **42** and the flexible common upper rim **25** such that the protective outer collar **26** provides a partial lateral shield. In other variations of this embodiment, the protective outer collar **26** provides a cap receiving area for receiving an outer cap wall **51a**, which forms another portion of the protective barrier. In yet other variations of this embodiment, a portion of the outer cap wall **51a** extend downwards beyond the top of the protective outer collar **26**.

[0029] Referring now to Figure 4C, an embodiment incorporating the features of the embodiment of Figure 4B is shown. In this embodiment a protective inner collar **28** is disposed upon the inner wall **20a** at the termination with the common upper rim **25**. The protective inner collar **28** is made of a hard material such as hardened plastic. In one variation of this embodiment the height of the protective inner collar **28** is such that the protective inner collar **28** extends upwardly beyond the frangible barrier **42** and the flexible common upper rim **25** such that the protective inner collar **28**, together with the protective outer collar **26**, provides a

channel containing and shielding the frangible barrier **42** and the flexible common upper rim **25**. In another variation of this embodiment the height of the protective inner collar **28** is such that the protective inner collar **28** extends upwardly but not beyond the frangible barrier **42** and the flexible common upper rim **25**.

[0030] Referring now to Figure 3, an overhead view of the chemiluminescent vessel **10** is shown. A compressible toroidal tube **40** defines a sealed second component cavity **44**. The interrupted toroidal tube **40** extends radially outward along the inner sidewall **20a** along the shoulder **30a**. The interrupted toroidal tube **40** extends along an arc around the perimeter of the sidewall **20a**. The arc spans less than 360 degrees, thus showing an interruption in the toroidal shape of the tube **40**. A remnant arc **130** is shown and is defined as equaling the arc of a circle less the span of the arc of tube **40**.

[0031] Figure 3 further shows a tab receiving area **36** extending radially outward over the shoulder **30a**. The tab receiving area **36** extends along the remnant arc **130** around the perimeter of the inner sidewall **20a**. The second or upper portion **14** of the vessel **10** is shown in Figure 3. The sidewall **30** is shown terminating in a neck **32** defining a fluid opening **33**. The neck **32** is shown having exterior lands **34**.

[0032] Referring now to Figure 2, an underside view of the cap assembly **50** is shown. The cap assembly **50** includes an inner cap **55**. The inner cap **55** extends downward from the inner cap top **50b**. Interior lands **54** are shown attached to the

inner cap **55** for mating with the exterior lands **34** of the neck **32** of vessel **10** so as to form a threaded rotatably separable closure.

[0033] Referring now to Figures 1, 1A, 1B and 2, a compression tab **52** is shown attached to the outer cap wall **50a** into the tab receiving area **36**. The cross-sectional view of Figures 1 and 1A shows that the compression tab **52** is disposed such that the interrupted toroidal tube **40** will mechanically interfere with movement of the compression tab **52** as the cap assembly **50** is twisted so as to open vessel **10** containing fluid **100**. The removal of the protective cap assembly **50** from the chemiluminescent vessel **10** of the embodiment of the invention of Figure 1 has three simultaneously and interlocked functions: it opens the vessel **10** providing access to the fluid **100** in the inner cavity **22**; it removes the protective barrier shielding the interrupted toroidal tube **40** from premature or unintentional compression; and it causes the compression tab **52** to compress the interrupted toroidal tube **40** sufficiently to rupture the frangible barrier **42a** and produce a chemiluminescent reaction.

[0034] One novel aspect of this invention is the method of assembly of the embodiments shown in Figure 1. Referring again to Figures 2 and 3, it can be seen that the embodiment of this invention shown as assembled in Figure 1 must have proper alignment of the compression tab **52** of the cap assembly **50** to prevent compression of the interrupted toroidal tube **40** during assembly. Since the vessel **10** is rotatably opened, one method of assembly would suggest twisting the cap

assembly **50**, and thus the inner cap **55**, onto the neck **32**. However, this would cause the compression tab **52** of the cap assembly **50** to rotate through and compress the interrupted toroidal tube **40** during this method of assembly.

[0035] This difficulty has been overcome by employing an additional embodiment of the current invention. In this embodiment, assembly is accomplished by first filling the inner cavity **22** with a selected fluid **100**. The cap assembly **50** is the positioned above and aligned such that the compression tab **52** is positioned above the tab receiving area **36** without extending over any portion of the interrupted toroidal tube **40**. With the components properly aligned, pressure is applied to the cap assembly **50** sufficient to force the inner cap **55** to slide over the neck **32**. Since the inner cap **55** and the neck **32** are composed of a yieldingly deformable material, the components elastically deform to allow the inner cap **55** to slide over the neck **32**.

[0036] The chemiluminescent vessel **10** of the embodiment of Figure 1 has an inner fluid cavity **22** suitable for packaging a beverage fluid **100**. Since the removable, protective cap assembly **50** is designed such that opening vessel **10** is necessarily simultaneous with compression of the interrupted toroidal tube **40** and rupture of the frangible barrier **42a**, the beverage **100** must be placed in the inner cavity **22** during assembly of the chemiluminescent vessel **10**. Thus, a user can safely assume that the presence of a light from chemiluminescent reaction upon opening the chemiluminescent vessel **10** signals the corresponding presence of the

originally packaged beverage (or other goods, such as a medicine) **100** within the chemiluminescent vessel **10**. This novel feature of the apparatus of this invention provides for a novel method of practicing the invention in the field of beverage delivery. The selection of the beverage **100** packaged in the chemiluminescent vessel **10** can be coordinated with the selection of the color of the chemiluminescence reaction through the selection of the chemical components comprising the first and second chemiluminescent fluids **110**, **120**. Thus the characteristic of color can be used to provide information regarding a characteristic of the packaged beverage **100**.

[0037] One example of using this novel method is coordinating the proof of an alcoholic beverage packaged within a particular chemiluminescent vessel **10** with the color of the chemiluminescent light produced by opening the chemiluminescent vessel **10**. In this exemplar method, the first and second chemiluminescent fluids **110**, **120** can be selected from a number of component chemiluminescent fluids to produce any of three chemiluminescent colors: green, blue and red. Similarly and by example, the alcohol content of the packaged beverage can be selected from **10** proof, **40** proof, and **100** proof. By matching each selectable color to a different selectable alcohol level, the color gives the consumer a visual signal of the alcohol content of a newly opened chemiluminescent vessel **10**. For example, green can be paired with **10** proof, blue can be paired with **40** proof, and red can be paired with **100** proof. Following this method, if an individual consumer who has been

provided an unopened chemiluminescent vessel **10** containing a beverage subsequently twists off the cap assembly **50** and observes a blue chemiluminescent light, that consumer knows that the beverage **100** contained within the vessel **10** has a **40** proof alcohol content.

[0038] Thus, in practicing this novel method, the methods of assembling the chemiluminescent vessel **10** further include the steps of selecting and providing the beverage **100** to be packaged in the chemiluminescent vessel **10** from a predetermined group of beverages. Next, a color is selected from a predetermined group of colors, each color of the group of colors corresponding to a separate beverage of the predetermined group of beverages. Then, selecting the first and second chemiluminescent fluids **110**, **120** from a predetermined group of chemiluminescent fluids, wherein the selected first and second chemiluminescent fluids **110**, **120** are adapted to reactively produce the selected color corresponding the selected beverage **100**. The appropriate components of a chemiluminescent vessel **10** containing the selected first and second chemiluminescent fluids **110**, **120** are then provided. The assembly of chemiluminescent vessel 10 so as to sealably package the selected beverage **100** proceeds as described above.

[0039] Other embodiments of this invention and methods of practicing the same are directed at other combinations of colors and beverages, such as soft drinks and sports drinks. Still other embodiments are directed at packaging consumer goods other than beverages, such as medicines, perfume, shampoo and mouthwash.

One skilled in the art will recognize that this invention and method of practicing the same may be modified for packaging fluids for use in various reduced visibility conditions.

[0040] Thus, although there have been described particular embodiments of the present invention of a new and useful Chemiluminescent Vessel, it is not intended that such references be construed as limitations upon the scope of this invention except as set forth in the following claims: